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11/29

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/517,179	12/07/2004	Hideaki Takeda	1503.72112	5695
24978	7590	03/14/2007		
GREER, BURNS & CRAIN 300 S WACKER DR 25TH FLOOR CHICAGO, IL 60606			EXAMINER HOANG, ANN THI	
			ART UNIT	PAPER NUMBER
			2836	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/14/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/517,179

Applicant(s)

TAKEDA, HIDEAKI

Examiner

Ann T. Hoang

Art Unit

2836

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 4/6/05, 1/6/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Objections*

1. Claim 1 objected to because of the following informalities: It appears that the word "contract" in line 4 of the claim should be changed to --contact--. Appropriate correction is required.
2. Claim 1 is objected to because of there is insufficient antecedent basis for "the minimum resistance value" in line 19 of the claim. Appropriate correction is required.
3. Claim 1 is objected to because of there is insufficient antecedent basis for "the power supply voltage" in lines 19-20 of the claim. Appropriate correction is required.
4. Claim 1 is objected to because of there is insufficient antecedent basis for "the contacts" in line 20 of the claim. Appropriate correction is required.
5. Claim 2 is objected to because of there is insufficient antecedent basis for "the contact opening voltage" in line 2 of the claim. Appropriate correction is required.
6. Claim 2 is objected to because of there is insufficient antecedent basis for "the opening of the first movable contact" in lines 2-3 of the claim. Appropriate correction is required.
7. Claim 3 is objected to because of there is insufficient antecedent basis for "said PTC" in line 3 of the claim. Appropriate correction is required.
8. Claim 3 is objected to because of the following informalities: The meaning of "an upper limit voltage in which range" is unclear. Appropriate correction is required.

9. Claim 4 is objected to because of the following informalities: It appears that the word "that" in line 3 should be changed to --wherein--, --such that--, or a similar expression. Appropriate correction is required.
10. Claim 6 is objected to because of there is insufficient antecedent basis for "said member movable" in line 3 of the claim. For the purposes of this action, "said member movable" will be read as "said movable unit." Appropriate correction is required.
11. Claim 6 is objected to because of the following informalities: It is unclear whether "the movable contact" in line 6 of the claim is referring to the first or second movable contact. For the purposes of this action, "the movable contact" will be read as "the movable contacts." Appropriate correction is required.
12. Claim 8 is objected to because of there is insufficient antecedent basis for "said movable member" in line 3 of the claim. For the purposes of this action, "said movable member" will be read as "said movable unit." Appropriate correction is required.
13. Claim 9 is objected to because of there is insufficient antecedent basis for "the opening of the first movable contact" in lines 4-5 of the claim. Appropriate correction is required.
14. Claim 13 is objected to because of the following informalities: It appears that the word "that" in line 3 should be changed to --wherein--, --such that--, or a similar expression. Appropriate correction is required.
15. Claim 16 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper

Art Unit: 2836

dependent form, or rewrite the claim(s) in independent form. The limitations of claim 16 are identical to that of preceding claim 15.

16. Claim 17 is objected to because of there is insufficient antecedent basis for "said member movable" in line 3 of the claim. For the purposes of this action, "said member movable" will be read as "said movable unit." Appropriate correction is required.

17. Claim 17 is objected to because of the following informalities: It is unclear whether "the movable contact" in line 6 of the claim is referring to the first or second movable contact. For the purposes of this action, "the movable contact" will be read as "the movable contacts." Appropriate correction is required.

18. Claim 19 is objected to because of there is insufficient antecedent basis for "the opening of the first movable contact" in lines 4-5 of the claim. Appropriate correction is required.

19. Claim 20 is objected to because of there is insufficient antecedent basis for "the opening of the first movable contact" in lines 4-5 of the claim. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2836

21. Claims 1-5, 8-16, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 6,958,671).

Regarding claim 1, Chen et al. discloses a current cutoff switch (10), comprising:  
a first fixed contact (22) which is formed in a prescribed inner position and is connected to a terminal unit (28) to be connected to an external circuit;

a second fixed contact (18) which is formed in another prescribed inner position and is connected to a terminal unit (26) to be connected to an external circuit;

a movable unit (30) with conductivity, for supporting first and second movable contacts (24, 20) which are disposed in positions corresponding to the first and second fixed contacts (22, 18), respectively;

a contact pressing means (16, 32, 34) for flowing current between the first and second fixed contacts (22, 18) via the first movable contact (24), the movable unit (30) and the second movable contact (20) by pressing the first and second movable contacts (24, 20) of the movable unit (30) on the first and second fixed contacts (22, 18), respectively;

a contact opening means (16, 32, 34) for first separating the first movable contact (24) pressed on the first fixed contact (22) from the first fixed contact (22) and then separating the second movable contact (20) pressed on the second fixed contact (18) from the second fixed contact (18); and

a non-linear resistor (36) inserted and connected between the movable unit (30) and the first fixed contact (22),

said non-linear resistor (36) has a resistance value fluctuation area indicating a minimum resistance value while inter-contact voltage shifts from 0V to a power supply voltage when large current between both sets of contacts is cut off by separating the first movable contact (24) from the first fixed contact (22) by the contact opening means (16, 32, 34), and after the current between the first and second fixed contacts (22, 18) is completely cut off by separating the second movable contact (20) from the second fixed contact (18), the non-linear resistor (36) is electrically separated from a contact circuit.

See Fig. 2 and 4:7-50. Once first fixed contact (22) and first movable contact (24) are separated, current is shunted to non-linear resistor (36). Thus, non-linear resistor (36) is indicating a minimum resistance value at this time. After second movable contact (20) and second fixed contact (18) are separated as well, current cutoff switch (10) is an open circuit. The reference does not specify that the current running through current cutoff switch (10) is a direct current. However, current cutoff switch (10) is disclosed as being applicable to various types of motors, which are commonly supplied with direct current. See 1:18-20. It would have been obvious to one of ordinary skill in the art at the time of the invention to make the current cutoff switch (10) a direct current cutoff switch in order to provide a current cutoff switch for a dc motor.

Regarding claims 2 and 11, Chen et al. discloses that said non-linear resistor (36) is a positive temperature coefficient (PTC). See 4:7. The reference does not disclose that a contact opening voltage at the time of the cutoff of the large current by the separation of the first movable contact (24) is located in the range of 28V to 48V, or in the range of 130V to 310V. However, the range of contact opening voltage at the

Art Unit: 2836

time of the cutoff would depend on factors such as the value of the non-linear resistor or the power supply voltage. It would have been obvious to one of ordinary skill in the art at the time of the invention to design the direct current cutoff switch using a non-linear resistor value and power supply voltage to produce the desired contact opening voltage, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 3 and 12, Chen et al. does not disclose that said PTC has an upper limit voltage in which range no thermal runaway occurs or a voltage/current characteristic where a lower peak is in the range of 80V or more. However, the range of upper limit voltages in which no thermal runaway occurs or the lower peak of a voltage/current characteristic would depend on factors such as the value of the PTC or the power supply voltage. It would have been obvious to one of ordinary skill in the art at the time of the invention to design the direct current cutoff switch using a PTC value and power supply voltage to produce the desired voltage/current characteristic and avoid thermal runaway, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 4 and 13, Chen et al. does not disclose that said PTC has a voltage/current characteristic that the position of peak current against voltage in a range where no thermal runaway occurs is located in a range of 2V to 20V. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to design



the direct current cutoff switch using a PTC value and power supply voltage to produce the desired voltage/current characteristic, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 5 and 14-16, Chen et al. discloses that current cutoff switch (10) is applicable to a motor, which be considered an induction load. See 1:18-20. Thus, it is understood that said external circuit would be a circuit for driving an induction load.

Regarding claim 8, Chen et al. discloses that said movable unit (30) is driven by an electro-magnetic coil (14). See Fig. 2 and 3:22-29.

Regarding claims 9, 19 and 20, Chen et al. discloses that said non-linear resistor (36) prevents an arc generated between the first movable contact (24) and the first fixed contact (22) at the time of the opening of the first movable contact (24). See 4:46-48. The reference does not specify that the arc is prevented from continuing for two milliseconds or more. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to design the direct current cutoff switch using a PTC value to produce the desired time of arc suppression, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10, 21 and 22, Chen et al. does not disclose that said non-linear resistor (36) indicates a resistance value for restricting current after the first movable contact (24) is opened to current by which an arc is not generated or

Art Unit: 2836

preferably to 1A or less. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to design the direct current cutoff switch using a PTC value to restrict the current a desired level, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

22. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 6,958,671), as applied to claims 4 and 13 above, in view of Takeda (US 5,659,285) and Inoue et al. (US 5,707,756).

Regarding claims 6 and 17, Chen et al. does not disclose that said movable unit (30) is driven by a bi-metal, or that said external circuit is a charging circuit or a charging/discharging circuit of a 28V or more secondary battery pack and also is a rated circuit whose opening voltage generated by the opening of the movable contacts (20, 24) at the time of charge or charge/discharge does not exceed 50V.

However, Takeda discloses a current cutoff switch comprising a movable unit (4) driven by a bi-metal (8). See Fig. 1 and 4:19-25. It would have been obvious to one of ordinary skill in the art at the time of the invention to make the movable unit of Chen et al. driven by a bi-metal, as disclosed by Takeda, in order to make the direct current cutoff switch responsive to high temperatures associated with overcurrent.

Furthermore, Inoue et al. discloses charging a secondary battery pack using current cutoff devices comprising bi-metals and PTCs. See 4:29-45, 34:1-2, 35:60-67 and 36:1-13. It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the direct current cutoff switch of Chen et al. in view of Takeda to

a charging circuit of the secondary battery pack of Inoue et al. in order to provide effective protection against overcurrents and overtemperatures to the secondary battery pack. Inoue et al. also discloses that the secondary battery pack may be applied to motors and vehicles. See 34:27-48. In this case, the secondary battery pack would conceivably be 28V or more.

Finally, it would have been obvious to one of ordinary skill in the art at the time of the invention to design the direct current cutoff switch using a PTC value to produce the desired opening voltage generated at the time of charge or charge/discharge, since it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

23. Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 6,958,671) in view of Takeda (US 5,659,285) and Inoue et al. (US 5,707,756), as applied to claims 6 and 17 above, and further in view of Limitor AG (DE 3128090).

Regarding claims 7 and 18, none of the references applied above disclose that in said PTC, the Curie temperature is set to a value higher than the operating temperature of the bi-metal.

However, Limitor AG discloses a current cutoff switch in which the Curie temperature of a PTC (16) is set to a value higher than the operating temperature of a bi-metal. See abstract. It would have been obvious to one of ordinary skill in the art at the time of the invention to set the Curie temperature of the PTC to a value higher than

Art Unit: 2836

the operating temperature of the bi-metal, as disclosed by Limitor AG, in the direct current cutoff switch of Chen et al. in view of Takeda and Inoue et al. so that the PTC would not limit current normally delivered between the terminal units, but would only limit current to suppress arcing after the bi-metal caused the direct current cutoff switch to open.

### ***Conclusion***

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hofsäss (US 5,973,587) discloses a temperature-dependent switch having a contact bridge and a PTC element. Roller et al. (US 4,580,123) discloses a thermal protective switch that employs a PTC element in order to prevent repeated switching. Furukawa (US 5,607,610) discloses an overcurrent and overheating protection device that employs a PTC element in order to provide a "self hold" feature.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ann T. Hoang, whose telephone number is 571-272-2724. The examiner can normally be reached Monday-Thursday and every other Friday, 8:00 a.m. to 6:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Sircus, can be reached at 571-272-2800 x36. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2836

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ATH  
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BURTON S. MULLINS  
PRIMARY EXAMINER